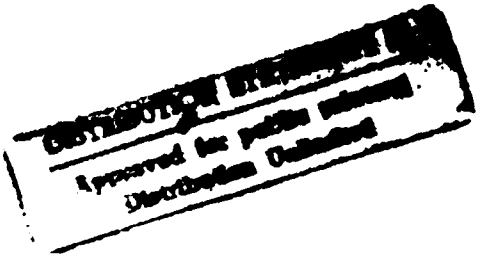
Contracting for Success
Developing Geothermal Resources on Military Lands

Volume I

NA301R1



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This report presents findings on ways to contract for geothermal development on military lands. The report concludes that the Federal Acquisition Regulation is inapplicable and inappropriate for private geothermal developmentt because such development does not use appropriated funds nor does it procure a supply or service. It recommends that the Navy develop a new legal instrument called a "license agreement," establish a demonstration project to test it, and reassign responsibility for geothermal contracting to a contracting office with the experience to respond flexibly and rapidly to geothermal development's unique requirements.

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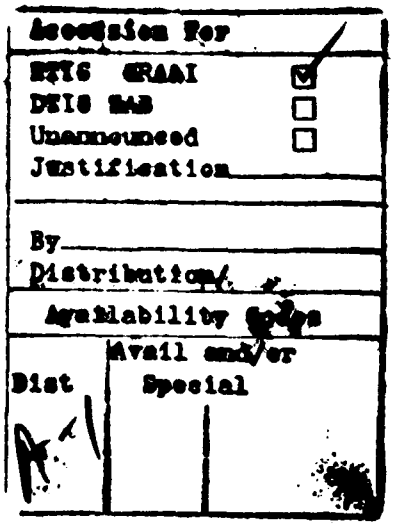

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Preface

This is Volume I of a two-volume study to identify the management tools needed by DoD to successfully exploit geothermal resources on military lands. Volume I contains the text of the report plus two appendices. Volume II consists of four appendices, each of which contains an example of a legal instrument with potential application to geothermal contracting by DoD.

Executive Summary

Geothermal energy is a renewable energy resource derived from the heat of molten rock beneath the earth. That heat is typically brought to the surface as pressurized hot water or steam and used to generate electricity. The one geothermal project brought to completion on land owned by the Department of Defense provides about $12 million a year for DoD while contributing close to 10 percent of the nation's total geothermal capacity. DoD's failure to develop additional geothermal energy resources on military lands represents a sizable lost opportunity. Delays in bringing those geothermal resources into production impose losses on the nation as well. More important, the potential failure of DoD's geothermal program may open military lands to development by other government agencies, removing control from DoD and endangering successful execution of the military mission on those lands.

The Navy's Geothermal Program Office – DoD's executive agent – must fulfill three basic requirements for a successful geothermal project. First, it must find a workable resource and provide enough information about that resource to convince private contractors (and their financiers) to risk their capital in its exploration and development. Second, it must select a developer that will be able to realize a satisfactory return and provide financial benefits to DoD. Third, the Navy needs to offer a contractual relationship that reduces the risks for DoD and the private developer while meeting the objectives of both. Successful geothermal contracting requires an arrangement more akin to a partnership – a public-private venture – than to a conventional acquisition agreement.

Given the current state of the geothermal industry – private geothermal development has slowed over the past decade – we find that the Navy cannot successfully exploit geothermal resources for DoD on military lands using the conventional contracting methods specified in the Federal Acquisition Regulation (FAR). Relatively simple contracts are used by the geothermal industry, and contractors have shown that they are no longer willing even to bid on projects tied to conventional FAR contracting mechanisms. Because private firms, to remain profitable, must choose carefully among the best remaining geothermal prospects, they have minimal interest in a contract that increases their risks and therefore costs.

More important, we find that FAR contracting methods are actually inapplicable to geothermal resource development. Because DoD does not use appropriated funds to develop the resource nor to procure a supply or a service, it does not have to follow the FAR when contracting for geothermal development. Quite apart from using appropriated funds, DoD earns revenues from geothermal projects and at the end of the contract term, it can require its contractor to remove all equipment and restore the site to its former condition.

The ideal contractual vehicle for geothermal development on military lands is a partnership in which both the Military Service and the geothermal developer benefit, and the FAR is only one of several mechanisms available for Federal contracting.

The Naval Facilities Engineering Command (NAVFAC) is the designated lead contracting agency for geothermal development because the Navy considers such efforts to be utility services. However, we find that geothermal development need not necessarily be considered a utility service because electricity from geothermal plants does not have to go directly to the host facility for DoD to realize a benefit. Power from the Coso geothermal project at the Naval Air Weapons Station, China Lake, Cal., for example, goes directly to the local utility's "grid." The Navy realizes financial benefits through offsets to China Lake's electricity bills.

We recommend that the Navy take three actions in this area:

- *It should develop its own legal instrument for geothermal development and call that instrument a "license agreement."* License agreement is a more accurate term for the business arrangement that licenses a private developer to develop geothermal resources under strict controls. That term also avoids the use of "contract," which implies FAR-type instruments to many Federal employees.

- *NAVFAC should establish a demonstration project to test innovative ways of successful contracting with private geothermal developers.* The demonstration project should utilize a type of licensing agreement that will hasten the development of geothermal sites on DoD land. The agreement should establish a public-private partnership between the Military Service and a geothermal developer.

- *NAVFAC should assign authority for the demonstration project to a contracting office that has the experience to respond flexibly and rapidly to the unique requirements of geothermal development.* We suggest either the Procurement Department, Naval Air Weapons Station, China Lake, or the Office of Naval Research, both of which are experienced in carrying out unconventional contracting procedures. Although the geothermal development program is DoD-wide, keeping contracting authority within the Navy has the advantage of keeping all geothermal development activities under the umbrella of a single Military Service.

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CHAPTER 1

Introduction

THE GOAL

The Logistics Management Institute (LMI) performed this study to identify the management tools DoD needs to successfully exploit the geothermal energy resources that lie beneath military lands. In this study, we define success as the introduction of new, producing geothermal plants on one or more military installations. A working geothermal plant produces electricity for sale to a local utility and possibly some for the local military installation. Revenues from those sales are divided between DoD, which owns the underground energy resource, and the private developer, which owns and operates the above-ground plant on DoD's behalf.

A successful geothermal project requires a legal agreement between DoD and a private firm that satisfies both parties (as much as possible) with their respective shares of the revenues and with their shares of the risks and burdens of operating a geothermal plant on a working military installation. A geothermal licensing agreement allows a private firm to make use of a natural resource owned and controlled by DoD. It is not a conventional acquisition transaction because DoD is acquiring neither goods nor services from a contractor. Instead, an ideal agreement is one in which DoD and the private firm act as partners in a public-private venture that shares the rewards and responsibilities of geothermal development. The rewards for DoD are managed encroachment, substitution of renewable energy for petroleum fuels, energy cost savings, and direct revenues. The private firm's reward is the opportunity to make a profit commensurate with its risk.

In this study, we concentrate on steps that the government can take to enable the contracting process to become a component in the success of DoD's geothermal program. While we discuss some physical and economic aspects of geothermal energy development, we do so only insofar as they influence contracting requirements.

Our objective is to provide a type of agreement that works by meeting the following requirements:

- It must attract private geothermal firms.
- It should increase neither the perceived nor the real risks that geothermal firms already face in attempting to find and exploit profitable sources of

energy underground. It must satisfy DoD's requirements by minimizing encroachment and protecting the military mission.

- As much as possible, it should balance the risks each party assumes such that private-sector firms are willing to bid, and DoD realizes reasonable financial benefits. It must meet all legal and regulatory requirements.

In short, the agreement must help make the process a success.

THE PROBLEM

The DoD has proven it can develop geothermal resources on military lands by bringing one very successful geothermal project to completion in the Coso Mountain range at Naval Air Weapons Station (NAWS), China Lake, Cal. However, lower energy prices and reduced economic activity in the West have made private firms much less eager to bid on new military geothermal projects. If DoD does not find a way to overcome those barriers and successfully develop geothermal resources on military lands, it may lose the authority to develop its own resources and, with that right, the ability to control encroachment as it sees fit. If DoD is unable to develop additional resources, it is entirely possible that the Bureau of Land Management (BLM) will reassert its former authority to develop geothermal resources on military lands as it currently does on all other Federal lands. Should BLM take back the supervision of geothermal development on DoD land, the Military Services will lose the ability to manage encroachment and, therefore, will risk damaging the successful execution of the missions assigned to their installations.

The Navy successfully developed DoD's first geothermal project and remains DoD's executive agent for geothermal development on all military installations. One of the Navy's major objectives in the initial Coso geothermal development was to manage encroachment on lands needed for Navy weapons testing. The Coso geothermal project started as a resource marked by abundant hot springs and fumaroles (wisps of rising steam) in the Coso Mountains. Because that resource lies in the extreme northwest corner of NAWS, China Lake, public and private parties interested in developing the resource originally proposed withdrawing the acreage from military use. To avoid that contingency, which would have reduced the Navy's ability to test weapons at the site, DoD sought and won approval from Congress to develop the resource itself.

To allow the Navy to supervise geothermal development at China Lake, Congress provided DoD with an explicit exception to the normal and long-standing practice of allowing BLM to develop all mineral resources on government land. Failure to develop additional resources, therefore, could conceivably cause Congress to reverse itself and return all authority to BLM.

In addition, each geothermal project that DoD forgoes imposes an opportunity cost in the form of financial benefits foregone. For example, DoD's Coso development has averaged close to $3.5 million per year in the form of energy cost savings and an additional $8 million to $9 million in direct revenues.

Delays in bringing DoD's geothermal resources into production impose losses on the nation as well by closing off or delaying development of a valuable renewable energy resource. Existing geothermal wells on DoD lands (all part of the Coso geothermal project) contribute close to 10 percent of the nation's total geothermal generating capacity.

WHAT IS GEOTHERMAL ENERGY?

Geothermal energy is a renewable energy resource derived from the natural heat of the Earth. Heat from molten rock, or magma, beneath the Earth's surface is captured in reservoirs of water-saturated rock. Profitable geothermal development requires that the reservoirs of saturated rock lie close enough to the surface to be reached by drilling wells into the saturated rock layers. Once the heated fluids from those underground reservoirs reach the surface, they can only be transported short distances before their energy content disperses through the loss of heat and pressure. Geothermal energy is usually converted into electricity for use elsewhere. Occasionally it is used directly for district heat or for process heat if a need exists close to the well site.

The material coming to the surface from an underground reservoir may be "dry" steam (vapor-dominated), hot water (liquid-dominated), or a mixture of both. Different technologies – including the "flash" method and the binary cycle – are used to capture the reservoir's energy content depending on the type of resource. Geothermal liquids often contain a variety of dissolved minerals, which can make the material – the "brine" – quite corrosive.

Because commercial geothermal resources must be relatively close to the surface, they are usually found in geologically active areas. Magma may lie close enough to the surface where the plates that make up the Earth's surface are either moving apart or colliding. Many geothermal projects and potential future sites are on the "ring of fire" of the Pacific rim. Most U. S. domestic resources, therefore, are located in the western states plus Alaska and Hawaii.

What Determines Reservoir Potential?

Geothermal companies look for underground reservoirs with the potential to power electric generators. The resource must not only be able to power a generator but must also have the potential to produce a significant number of megawatts over a period of at least 20 years. The threshold for commercial development depends upon the cost of production and the anticipated price for the sale of electricity; it is usually above 10 megawatts. The average geothermal plant

produces about 39 megawatts, but half of the producing plants generate 25 megawatts or less.

Geological, geochemical, and geophysical studies provide the preliminary data that guide the selection of likely drilling sites. The only way to be certain that a commercially viable geothermal reservoir exists is to drill wells. Usually more than one well is needed to estimate the extent and the characteristics of the site. The most important characteristics that companies are looking for during the exploration phase are the depth, breadth, temperature, and rock permeability of the reservoir. The depth helps determine the economic and technical feasibility of reaching the reservoir. The breadth of the field determines the number of wells, which is key to the amount of energy the field can produce. The temperature also helps determine the amount of energy available for generating electricity, and the permeability determines the ease and, therefore, the cost of production. The economics of a site also depends on whether it is a vapor-dominated or liquid-dominated resource, because that characteristic determines the type of plant and the investment costs.

Differences Between Geothermal Exploration and Oil and Gas Exploration

Geothermal reservoirs usually occur in hard igneous or metamorphic rock, unlike the relatively softer sedimentary rock associated with deposits of oil and gas. Geothermal drilling has slower penetration rates, which results in more wear and tear on drilling equipment. It is more expensive per foot, therefore, than the average cost of conventional oil and gas drilling. In addition, the high temperatures found in geothermal wells require special types of drilling mud and equipment that can function under conditions of high heat and hard rock. Geothermal wildcatters use special rotary drilling rigs and other equipment to meet the high-temperature, high-stress demands of drilling. In short, geothermal projects are more technically demanding than most oil and gas drilling projects.

CHAPTER 2

Developing Geothermal Resources

WHY SHOULD DoD DEVELOP GEOTHERMAL ENERGY?

An argument can be made that because the development of geothermal energy is not a military mission, some other government agency should be responsible for it. In fact, BLM already manages geothermal development on all other Federal lands and manages the development of Federal mineral resources in general. Its aim is to expand the private development of natural resources on government land. That goal, however, has the potential to conflict with DoD's main objective in developing geothermal resources, which is to preserve the military mission by managing encroachment on DoD lands.

The Navy's Coso development at China Lake is a prime example of the way in which control over resource development preserves the military's control over its mission. Incorporated in the Navy's agreement with the developer is the right to evacuate the firm's employees from the site when weapons testing is scheduled to take place, which occurs once each week on average. The Navy has retained its land and the ability to conduct its mission without being impaired. The geothermal firm has accommodated the Navy's requirements by incorporating equipment that allows it to conduct remote operations when its staff has been evacuated.

In addition, geothermal development by DoD supports current national energy policy by substituting renewable energy for petroleum fuels. Geothermal development also creates financial benefits in the form of electricity bill rebates and additional revenues that DoD can use to lower the cost of utilities and apply to energy-efficiency projects. The Navy's geothermal development at NAWS, China Lake, generates approximately $12 million in combined cost savings and direct revenues annually.

DoD's Executive Agent for Geothermal Development

The Geothermal Program Office (GPO), established and run by the Navy, is the DoD executive agent responsible for developing geothermal energy on all military lands. The GPO acts on DoD's behalf for all of the Military Services. Its mission is to find viable resources and develop them by bringing in private developers with the necessary capital and expertise. The GPO looks for sites at which underground heat lies close enough to the surface to be profitably exploited. It also manages existing geothermal projects such as DoD's current

geothermal development at NAWS, China Lake, which contributes close to 10 percent of the nation's total geothermal generating capacity.

Even though it is located at a Navy installation and supervised by the Navy, GPO works on behalf of all of the Military Services. While DoD's successes to date owe a great deal to the efforts of the Navy, geothermal development is a DoD program and is not limited to the Navy. GPO's lists of potential geothermal development sites include Army, Air Force, and Marine Corps installations.

Requirements for a Successful Geothermal Project

A successful geothermal project must fulfill the following three requirements:

- The GPO must find a viable resource, and it must provide enough information about that resource to convince private firms (and most important, their financiers) that the resource is good enough for them to risk capital in its development.

- The price that nearby utilities will pay for electricity must be sufficient to provide an adequate profit after the firm's development and operating costs.

- The DoD needs to offer a contractual relationship that reduces the risks for both parties while meeting the objectives of both.

The first requirement for a successful geothermal project *is a viable resource.* One of GPO's major functions is to locate exploitable sites on military lands. Working with existing data from the U. S. Geological Survey, GPO developed a preliminary list of DoD sites with geothermal potential. Using additional unpublished and newly acquired data, GPO has narrowed that preliminary list, creating shorter first-, second-, third-, and fourth-order lists, each having a successively higher probability of yielding geothermal energy in economic quantities. Sites on the fourth-order list have the highest potential and GPO is giving them top priority for development.

To attract private developers, DoD needs to establish the credibility of the resources so that developers believe the resource can be brought to market at a profit. Geothermal firms examine all available data on reservoir temperature, permeability, and size. Based on those data, they decide whether the risks make it worth spending the money for exploratory wells, each of which can cost $500,000 or more. Not only must GPO provide enough information on the resource to convince geothermal developers of its viability, they must also persuade the firms' financiers that the resource is good enough for them to risk capital on its development. The exploration phase of geothermal development is by far the riskiest because no one knows the reservoir characteristics with certainty before sinking several exploratory wells. The GPO has decided that, in some instances, DoD will share some of that risk by drilling one or two preliminary wells to provide more information to industry.

The second requirement is that a local market exist for electricity at a price that generates a profit sufficient to offset the risks of development and production. Geothermal energy is used most commonly for generating electricity. Although that electricity can, in theory, be transported great distances, it is usually sold to a local utility, which must have uncommitted transmission-line capacity available. Electricity sales are made according to power-sales agreements that, ideally, cover a period long enough to guarantee the developer a reasonable return on its investment. The costs of line losses that reduce revenue associated with long-distance transportation, "wheeling," and the uncertainty of sustained access (the "bumping-rights" issue) make selling electricity to nonlocal utilities riskier and costlier than selling locally.

The "avoided cost" is the price that a utility is required by law to pay for electricity generated by a third party. The avoided cost is variously defined as the cost per kilowatt hour of new generating capacity (long term) or the spot price for electricity (short term). Because electricity is not a fungible commodity, the avoided cost varies by region, even within a state. Put another way, the transportation cost for electricity is high enough to allow significant regional price differences, which are set by state public utility commissions or public service commissions.

The third requirement is that DoD must be able to reach agreements with knowledgeable resource development firms that are "utility-grade" partners. That is, such developers are acknowledged by the utility industry, which comprises the market, as being reputable, reliable firms that have proven track records for delivery on power sales agreements. *Not only are such firms easier* for DoD to work with, they are probably the only firms capable of reaching power-sales agreements with electric utilities, and those agreements are essential for successful projects.

The DoD needs firms to drill exploratory and development wells; to construct gathering systems, generating plants, and the other necessary infrastructure; and to operate the facility. For each project, DoD can seek a prime contractor to oversee the entire effort. That contractor, in turn, will frequently use subcontractors.

The first two requirements, adequate physical resource and economics, are largely external. While DoD cannot improve the underlying geologic resource, it can provide substantial information on its geological, geochemical, and geophysical characteristics. Similarly, DoD cannot influence the market for electricity although it may be able to provide a limited market for some of the power at the host facility.

However, DoD can control the types of agreements that it offers to potential industry partners. Such agreements need to provide flexibility that is more akin to a partnership than to a conventional government purchase agreement. They should strive to avoid unnecessary requirements on either party while providing a framework in which reward is commensurate with risk.

The Coso geothermal development project at China Lake was a success because the first two requirements were fulfilled more than adequately. The resource was known to have high potential and energy market conditions at that time made the local electric utility more than willing to enter into a long-term power-sales agreement that guaranteed an escalating price for electricity. The agreement was signed during the time of the Iranian oil crisis, when energy prices reached an all-time high. Firms were eager to develop the resource and willing to tolerate almost any contracting mechanism that DoD wished to impose.

Over the past decade, electricity prices have fallen along with other energy prices, and the military's remaining geothermal resources, while promising, are not as obvious as China Lake's Coso reservoir. Those problems are not unique to DoD. Throughout the West, where the best geothermal prospects still lie, geothermal firms have already tapped the most conspicuous resources and now face lower electricity prices. Compared with the past decade, private development has slowed.

THE GEOTHERMAL INDUSTRY

The geothermal industry is not large. It supplied only about 0.3 percent of the country's electric power, or roughly 2,800 megawatts, in 1992. In California, however, geothermals are the second largest source of renewable energy, supplying more than 5 percent of all power generated in the state.[1] In ways somewhat similar to oil and gas "wildcatting," geothermal firms look for sites with the potential to produce commercial quantities of energy. The difference lies in the fact that the energy contained in steam from the ground is normally converted into electricity. Electricity is a nonfungible commodity that must be generated on site and sold locally. Unlike oil and gas, which can be transported around the world and traded in international markets, the profitability of a geothermal site heavily depends on the local electricity market.

The life cycle of a geothermal project comprises five basic phases: investigation, exploration, infrastructure development, production and maintenance, and field abandonment. Each of those phases has associated costs, risks, and expected returns. Many parties are involved in each phase, including the geothermal firm, the bank or other lending institution, the electric utility, the landowner, and the mineral-rights owner. A geothermal firm may be a single company, a consortium, or even a series of different firms that carry out successive phases of the project.

The life cycle begins with the investigation phase during which a geothermal firm's engineers develop a short list of potential geothermal sites. During that phase, the firm develops a site assessment and a preliminary technical and

[1] "Geothermal Energy Market in Southern California; Past, Present and Future," *Geothermal Program Review X, Proceedings,* U.S. Department of Energy, Vikram S. Budhraja, 24 - 26 March 1992.

economic feasibility analysis. If the site passes the feasibility criteria, then the firm proceeds to the exploration phase.

During the exploration phase, firms delineate the resource by gathering data on reservoir size, temperature, and rock permeability. Exploration incurs up-front costs for acquiring the mineral rights to the land and, most significantly, for drilling exploratory wells.

If the exploration phase is successful, the firm can go on to the infrastructure development phase during which it builds gathering systems, power generators, control rooms, electricity transmission lines, and the other necessary infrastructure to support the geothermal field. The cost of installing high-quality turbines and pipelines that resist corrosion from geothermal brine is high.

Once the infrastructure is in place, the production phase can begin. During that phase the firm finally reaps the rewards of its previous investment. Geothermal plant operators not only generate electricity but must also maintain their gathering and generating equipment. In addition, they must work to keep up the pressure in their existing wells and drill new wells to replace those that become less efficient over time.

The final phase is field abandonment. At some point, the resource is fully exploited and the operation has to be shut down and dismantled. The site must be restored consistent not only with the terms of the lease but also in accordance with environmental laws and regulations.

Geothermal Industry Objectives

Above all, geothermal firms, their financiers, and the utilities to which they sell their output all have as a single goal to make a profit by finding and developing geothermal resources. Geothermal exploration – like oil and gas "wildcatting" – is a high-risk venture. The profits required to attract investors, developers, and utilities, therefore, must be higher than those needed for lower risk ventures.

The highest risks occur during the exploration phase where the costs are high and the likelihood of success is uncertain. Exploratory drilling involves many variables that determine success or failure. Will the firm pick the right spot on which to drill? Will drilling proceed without mishap? Is the geologic resource good enough to produce economic quantities of energy? Exploratory wells cost $500,000 or more and several wells are required to properly characterize the resource. Although the risks inherent in infrastructure development are lower than the risks of exploration, the firm must still invest a considerable amount to install high-quality, corrosion-resistant equipment before it is able to generate any revenue.

Once the firm moves into the production phase, the nature of the risks shifts to maintaining the supply of geothermal energy and to avoiding the downside

risks of supply and demand in the local electricity market. To maintain the supply, geothermal plant operators must maintain the pressure in existing wells and drill new wells to replace old ones. In addition, the geothermal firm must continue to sell its power at a price that covers operating costs and returns its "expected" profit. The geothermal firm usually shifts most of that risk onto the utility, however, by signing a long-term power-sales agreement. Such agreements are normally an essential first step for obtaining funding from banks and venture capital firms.

The first and last phases of the project normally entail less risk. Site investigation is typically an ongoing business activity for a geothermal firm and the risks are low; the costs are a normal part of doing business. The abandonment phase is a planned activity that entails little risk as long as it takes place as planned. The major risk at this point is the possibility of increasingly stringent, and hence more expensive, environmental standards for restoration.

As indicated in Table 2-1, the definition of an acceptable profit varies with the degree of risk. While the numbers shown are only an indication and change depending on conditions in the financial markets (as well as the specific resource), the fact remains that exploration is generally the riskiest phase of the project. The combined development and production phases are also somewhat riskier than the operation of a conventional utility plant, largely because output depends on the continuing health of the reservoir. For example, The Geysers steam field in California has suffered from overproduction resulting in declining revenues. The major risk to utilities is that electricity prices will drop below those agreed upon in the long-term power-sales agreement.

Table 2-1.
Typical Geothermal Return on Investment

Phase	Risk	Return on investment (ROI) (approximate)
Exploration	High	25 percent
Development/production	Low/moderate	14 percent
Weighted average geothermal	Moderate	17 percent
Conventional utility plant	Low	12 percent

The profit earned by the participants in a geothermal project ultimately results from competition among firms. The degree of competition depends upon various factors, including the number of firms interested in a specific resource, the number and quality of other available geothermal resources, and the cost of financing.

Geothermal firms look for the "best deal" among alternative available resources. The major factors that a firm has to ensure are in place are the following:

- An underground reservoir with adequate heat and pressure
- Sufficient avoided cost for power
- A long-term power-sales agreement with a local utility
- The existence of transmission lines with available capacity.

If the Navy assumes the role of a wildcatter, it can *expect* both its profits and its risks to increase. While it has no guarantee that its profits will go up, however, its risks certainly will. Dry wells must count against successful wells. Dry or wet, geothermal wells cost at least $250,000 to $500,000 each and sometimes more. Moreover, several wells are normally needed to "prove" a field.

Industry Concerns

What does the industry's desire for a reasonable profit mean to DoD? First of all, industry participants want to avoid items that add additional real or perceived risks. Those items include cumbersome contracting mechanisms that absorb time and thus add real risks and costs to a firm that is not used to working with Federal contracting officers (other than those at BLM, whose leases are well understood). Specific clauses that add to the costs of geothermal development are the requirements to use the Davis-Bacon Act labor rates and the Buy American Act clauses. Private developers also want the government to explicitly acknowledge valid risks to the private party such as the possibility that base closing or mission changes could affect the geothermal project.

CHAPTER 3

Applicability of the Federal Acquisition Regulation to Geothermal Development

The mission of GPO is to develop geothermal resources found within lands under DoD jurisdiction. The plan for such development calls for private commercial geothermal companies to explore selected reserves, construct the necessary facilities, and produce power. In return, the private companies offer DoD such compensation as a portion of the revenues from the sale of power, power itself, or reduction of utility fees. The government does not intend to acquire title to the facilities constructed by the geothermal developer.

The first venture by GPO in geothermal development at NAWS, China Lake, resulted in a resounding success. In a second attempt, however, at Naval Air Station (NAS), Fallon, Nev., no major, experienced geothermal firms bid on the government's request for proposals for the resource development. The GPO identified several probable causes for the failure to attract qualified firms. Among the most prominent of these was the geothermal industry's aversion to the contract's terms and conditions, which followed the requirements of the Federal Acquisition Regulation (FAR). Thus, the Fallon experience presents some significant questions: Did the use of FAR-based contracting present a serious obstacle to the furtherance of GPO's objectives at NAS Fallon, will it continue to do so for the whole of DoD's geothermal program, and if so, what can DoD do about it?

PROBLEMS POSED BY FEDERAL ACQUISITION REGULATION CONTRACTING

The FAR is the body of contracting policies, rules, and procedures applicable to all Federal executive agencies when they purchase goods or services using appropriated funds. The FAR and the supplementing rules unique to each agency (such as the Defense FAR Supplement, the DFARS) cover in elaborate detail every stage and aspect of contracting, including planning for a purchase, advertising and soliciting bids from potential sellers, selecting a contract awardee, administering and overseeing contract performance, and terminating a contract. The FAR provides hundreds of detailed clauses that must be used in specific types of contracts, for specific kinds of products or services being purchased, and for various other contracting circumstances. Many of these FAR rules and clauses impose on contractors extraordinary performance and administrative requirements that would not be found in the commercial world. Some of these requirements are designed to implement socioeconomic laws (such as assisting minority-owned businesses), while others are designed to give the government

greater protection as a buyer than would be typical in the commercial marketplace.

As a whole, these FAR requirements constitute a unique system of doing business that is so different from the normal commercial system that it has become very difficult, if not impossible, to mix or integrate the two. For example, companies that do business with commercial firms and with the government routinely set up separate cost centers or even corporations dedicated to the two different marketplaces, with completely different accounting, engineering, production, and marketing systems. This wall separating the government and commercial marketplaces has been repeatedly cited by Presidential commissions and independent studies as a serious problem in government procurement. For example, the chairman of the recent Section 800 Committee (the latest in a host of commissions studying defense procurement) singled out two recommendations as most critical in reforming defense business.[1] One of those was a proposal to eliminate the artificial contracting barriers between government and commercial marketplaces so that DoD could take advantage of lower costs and many advanced technologies in the commercial sector that are not now available to DoD. They are not available to DoD because the commercial companies that sell these products and services refuse to alter their way of doing business solely to satisfy the unique FAR requirements. They simply will not sell to DoD if the host of FAR requirements are made conditions of the sale.

Problems with FAR Contracting for Geothermal Development

Geothermal development companies, such as those DoD will be dealing with in any future geothermal venture on DoD lands, are commercial firms that rarely contract with Federal government agencies, and when they do, it is almost exclusively with BLM, which does not use the FAR when contracting for geothermal development. As explained below, that agency has statutory authority to use other contracting mechanisms more like those prevalent in the commercial marketplace. Thus, even with the government, FAR-based contracting is an alien way of doing business for these geothermal companies, and they have the usual commercial corporation antipathy to dealing with the government through FAR mechanisms. Representatives of commercial geothermal developers have indicated that the use of FAR-type contracting is a significant barrier to them when considering whether to bid for contracts to develop geothermal resources on DoD lands.

What are some of the specific kinds of FAR contracting requirements that are seen by commercial geothermal firms as significant barriers to participating in joint ventures with DoD to develop geothermal resources? Generally, they fall into two categories: government-unique terms and conditions and pricing and audit requirements.

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[1] *Streamlining Defense Acquisition Laws; Report of the Acquisition Law Advisory Panel to the United States Congress,* January 1993.

With regard to government-unique terms and conditions, the FAR's numerous socioeconomic requirements are seen as alien, burdensome, and potentially dangerous to the company. Companies with large FAR contracts ($500,000 for most contracts; $1 million for construction contracts), for example, are required to develop plans showing how the contractor will place subcontracts with small businesses and small businesses owned and controlled by socially and economically disadvantaged individuals. These plans are made part of the contract, and the contractor's failure to comply in good faith with the plan constitutes a material breach of the contract. Severe penalties, including contract termination, can be imposed. Similarly, in large contracts, the contractor is required to have a plan for placing subcontracts in areas of high unemployment or underemployment.

As another example, requirements to pay laborers and mechanics time-and-a-half for work in excess of 40 hours a week are imposed, and the contractor must extend that requirement to all its subcontractors. Contractors are also required to comply with labor wages, hours, and working conditions set by the Department of Labor under various statutes, such as the Davis-Bacon Act (construction), the Walsh-Healey Public Contracts Act (supply contracts), or the Service Contract Act (service contracts). These wages are often much higher than the contractor would normally pay. For example, Davis-Bacon Act mandated wages have been estimated to inflate the cost of Federal construction by about 30 percent.[2] Thus, these requirements can impose significant additional costs and risks of business on contractors.

The FAR contracts also require the contractor to conduct affirmative action hiring for handicapped persons, disabled veterans, and veterans of the Vietnam era and to refrain from discriminating in hiring or on-the-job actions on the basis of race, color, religion, sex, or national origin. Violations can result in contract termination.

Numerous clauses proscribe certain contractor conduct, such as paying a person other than an employee or established commercial or selling agency to solicit business in return for a commission, percentage, brokerage, or contingent fee. In many cases these and other requirements have not only severe contractual penalties for violation, but criminal sanctions as well.

Many FAR contract clauses require that preference be given to certain products or services. For example, U.S. private vessels must be used to ship certain supplies, and contractors must purchase jewel bearings from a designated domestic source. However, the most commonly encountered mandatory buying preference involves the Buy American Act. Under that law, government agencies must give a preference in their purchasing to domestic products. A product is considered domestic if the cost of the domestic materials used in the product is more than 50 percent of the cost of all materials used in that product. Certain narrow exceptions to the rigors of the Act may apply, such as if the final cost would be unreasonable. Carefully defined differentials are used to determine

[2] "The Budget Cuts Clinton Missed," *The Wall Street Journal*, Niskanen and Moore, 16 August 1993, p. A14.

when the cost of a domestic product is, in fact, unreasonable. Commercial companies often find those requirements extremely dislocating, because they disrupt their normal supplier relationships.

In addition to these unique government socioeconomic contracting requirements, numerous other contracting terms have no corresponding commercial counterpart. For example, unlike commercial contracting under the Uniform Commercial Code (U.C.C.), the FAR gives the government the unilateral right to issue changes to the contract, as long as the changes are within the original scope of the contract. The contractor receives an appropriate adjustment in payment, additional performance time, or other compensatory change, but the contractor is bound to continue performance under the new terms. That change may pose a significant burden to a commercial contractor who has made other commitments. The government can also terminate any contract at its convenience, with appropriate equitable compensation to the contractor.

Commercial companies, including geothermal developers, generally have great difficulty dealing with the detailed pricing and audit rules that are applicable to FAR procurements. In their normal commercial business, most of these companies do not submit detailed pricing data to their customers. However, under the FAR, contractors must submit detailed cost or pricing data used to support their proposals in any contract or contract modification whose value is more than $500,000, when the price is not set by adequate competition, is not an established catalog or market price, or is not established by law or regulation (such as utility rates). The contractor must certify in writing that these data are accurate, complete, and current at the time of agreement on contract price. The same requirements apply to all similar subcontracts. A whole body of legal rulings and court decisions defines what all these terms mean and the circumstances constituting proper certification. Severe penalties can apply to violations.

Under the FAR system of contracting, the government can examine or audit contractors' records. For example, in negotiated contracts, the contractor must maintain the following records and give DoD the right to examine and audit them: books; records; documents and other data relating to the claimed costs of performance; the cost or pricing data used to support the pricing of the contract (or modification); and any cost, funding, or performance reports required under the contract. Furthermore, negotiated contracts generally give the Comptroller General of the United States the right to examine the contractor's records related to the contract for up to 3 years after final payment. This right must be included in all subcontracts as well. Contractors are also required to comply with the government's Cost Accounting Standards, which may be quite different from a commercial company's normal way of accounting.

All these FAR requirements and numerous others, as well as the host of legal rulings and court decisions that explain them, constitute an entire system of doing business that is radically different than the system most commercial contractors are familiar with. Commercial vendors, including geothermal companies, are reluctant to venture into that realm because many of these requirements have severe penalties attached.

Experience with FAR Contracting for Geothermal Development

Why then did the Coso geothermal project work successfully, even though a FAR contract mechanism was used? Because the circumstances were so economically compelling that geothermal companies probably would have worked around almost anything. First, the resource was overwhelmingly favorable – a clear winner; and second, the cost of energy at the time and regulatory requirements from the State of California combined to make the investment economics compelling. Thus, even though the FAR contract was a major barrier from industry's viewpoint, companies were willing to bid anyway because the economic positives overwhelmed the contract negatives.

Almost everyone agrees that the combination of factors that made the Coso project so attractive to the geothermal industry do not now prevail and may never occur again. Today, alternative energy costs are sharply lower, making other investments more lucrative and the known potential remaining DoD geothermal sites are not such sure winners as Coso geothermal project was. Thus, for future DoD sites to be attractive to the industry, especially compared to competitive sites on private or BLM lands, other factors, such as the degree of risk assumed and the contract conditions, must be favorable.

Applicability of FAR to DoD Geothermal Ventures

In attempting to enhance the attractiveness of DoD's geothermal development opportunities to industry, a first question, then, is whether the FAR system, with all its negatives from commercial industry's point of view, must be used when contracting for DoD's geothermal development. We find that the answer is no.

To begin with, not all government contracting is FAR-based contracting. The FAR is only used when a Federal agency uses appropriated funds to purchase a product or service, including construction, and not even for all those occasions. Specifically, the FAR states that it is applicable to all acquisitions and defines acquisition as "... the acquiring by contract with appropriated funds of supplies or services (including construction) by and for the use of the Federal Government through purchase or lease, whether the supplies or services are already in existence or must be created, developed, demonstrated, and evaluated." (FAR 1.103 and 2.101)

So, for example, DoD does not use the FAR when it purchases real property. And DoD nonappropriated funds, such as officer and noncommissioned officer clubs, commissaries, post exchanges, and welfare activities, do not use the FAR for their contracting. Furthermore, even when appropriated funds are used to purchase some products or services, such as in research and development, other non-FAR contractual-type legal instruments are often used, such as grants or cooperative agreements.

The same is true for civilian agencies as well as DoD. Indeed, in the closest analogous Government activity to that intended by GPO – BLM geothermal development contracting – the FAR is not used. Instead, when BLM enters into agreements with commercial companies to explore and develop geothermal resources on BLM lands, the agency uses its own standard "lease" agreement, with supporting rules. Those rules and standard lease contracts are derived from BLM's statutory authority granted in the Geothermal Steam Act of 1970. The BLM never uses FAR contract terms and provisions even though, obviously, some appropriated funds, such as employee salaries, are used to support the BLM program. BLM's contracting authority for geothermal resources is derived from the separate authority of the Geothermal Steam Act and not the Federal Property and Administrative Services Act, which underlies civilian agency contracting pursuant to the FAR. For normal kinds of property and service procurements with appropriated funds, BLM uses FAR-based contracting.

Similarly, the National Park Service (NPS) uses FAR-based contracting routinely when buying products and services with appropriated funds. Yet, when NPS contracts with commercial companies for concessions on National Park lands, it uses its own standard contracts and rules that are completely independent of the FAR. Like the BLM geothermal development contracts, the NPS concessions contracts involve public-private ventures almost identical in essential arrangement to what GPO aspires to set up for its geothermal developments. The NPS concessions agreements, for example, involve private companies that develop properties or services, such as hotels, on government lands entirely at their own expense. In return for this franchise in the National Parks, the concessionaire pays a royalty to NPS from its receipts. As with BLM's geothermal leasing authority, the NPS has independent statutory authority [16 U.S. Code (U.S.C.) Sections 20 - 20g)] for this concessions activity and for the contracting that implements it.

Does the DoD geothermal development program similarly have independent statutory authority for its contracting, totally separate from the FAR? Yes, clearly it does. That authority resides at 10 U.S.C. 2394, 2483, and 2689. These provisions were not passed as part of the statutory authority for DoD FAR-based contracting, the Armed Services Procurement Act (ASPA) of 1947 (10 U.S.C. 2301 - 2329) and amendments to it. As a matter of fact, when Congress passed the first of these permanent DoD geothermal authorities (now 10 U.S.C. 2394), it was originally entered into the code of permanent statutes along with the Geothermal Steam Act of 1970, at 30 U.S.C. 1002a – not even in the Armed Services title of the code (Title 10). Thus, clearly the legislature did

not intend for DoD's geothermal contracting to be regulated as part of ASPA and its implementing rules (for DoD), the FAR.

This independence of DoD's geothermal contracting authority is specifically recognized by the DFARS. In Part 241 governing the acquisition of utility services by all DoD components, Section 241.002, Applicability, states the following:

> (b)(7) This part *does not apply to third party financed projects* [emphasis added]. However, it *may* [emphasis added] be used for any purchased utility services directly resulting from such projects, including those authorized by –
>
> (A) 10 U.S.C. 2394 for energy, fuels, and energy production facilities for periods not to exceed 30 years;
>
> ....
>
> (C) 10 U.S.C. 2689 for geothermal resources that result in energy production facilities;

In other words, the FAR rules for purchasing utility services do not apply to DoD geothermal development projects as they are currently envisaged, but agencies may, if they wish, use the FAR mechanisms if they believe they might be advantageous. The DFARS regulatory language is, in legal terms, "permissive," not mandatory; that is, the geothermal program is permitted to use FAR contracting mechanisms when purchasing utility services resulting from geothermal development under the program, but it is not required to do so. That permissiveness would not be legally possible if the geothermal program's statutory contracting authority was subordinate to the ASPA and FAR. Thus, the FAR/DFARS themselves acknowledge the independent statutory basis for the geothermal program's contracting.

Therefore, the FAR does not apply to DoD's geothermal joint venture concept, just as it does not apply to BLM's geothermal development program or to the NPS's concessions program, for example. Nor have those agencies voluntarily chosen to use FAR contacting mechanisms as somehow advantageous in their joint venture efforts with commercial vendors. The same can be said for DoD's nonappropriated fund activity purchases and DoD's real estate purchases. When given the choice of using FAR contracting or crafting their own contracting mechanisms to fit their specific needs, most agencies (including those within DoD) choose not to use the FAR. Joint ventures of the kind envisaged in the DoD geothermal program are particularly inappropriate situations in which to apply FAR requirements and contract mechanisms.

CONCLUSIONS

The DoD and especially the Navy as lead agency aspire to develop geothermal resources on military lands in partnership with commercial geothermal development companies. The GPO concept for development involves an arrangement by which the selected private company or companies make all the

investment necessary for exploration and development of the government-identified resources, using only private funds. In return for granting the opportunity to the private company to sell the power generated by the developed resource, DoD and the Military Service will receive a "royalty" or other form of remuneration.

Such an arrangement does not fall within the mandatory use parameters of the FAR. The FAR is applicable only to contractual acquisitions in which appropriated funds are used for products and services, including construction. The GPO's geothermal projects will not spend appropriated funds; rather, just the opposite will occur – private companies will spend private funds and DoD will receive a portion of any resulting proceeds from the sale of power as cost savings, direct revenues, or both.

The GPO has its own independent contracting authority that permits it to develop whatever contracting instrument best serves the purposes and goals of the DoD geothermal development program. The FAR is not such an instrument; in fact, it has been identified as a major barrier to getting the best-qualified commercial companies to participate in this public-private venture.

Thus, the Navy can develop a unique non-FAR legal instrument to carry out the purposes of the program, generally, and individual geothermal projects, specifically. In Chapter 4, we examine various types of legal agreements and the way in which they meet or do not meet GPO's requirements.

CHAPTER 4

Legal Instruments for Geothermal Development

AGREEMENT REQUIREMENTS

Having concluded that DoD needs to develop a new legal instrument for its geothermal program, we now examine some selected types of instruments that might be used in geothermal contracting. Those instruments are good models for DoD's geothermal contracting. To create a successful geothermal agreement, the legal instrument needs to meet as many stakeholder concerns as possible. (Stakeholders are parties interested in the ultimate success of the project.) Private-sector stakeholders include firms involved in exploration, development, and production as well as financial firms that provide capital and the utilities that purchase power. Government stakeholders include the installation commander, the contracting officer, GPO, the Naval Facilities Engineering Command (NAVFAC), other Military Services on whose installations geothermal resources exist, and other interested individuals and organizations.

We first present a listing of the assumptions we made in our comparative analysis, and then we briefly describe each legal instrument, a list of its advantages, and a list of its disadvantages (see Table 4-1). Appendix A provides a comprehensive list of stakeholder concerns identified by the participants at a geothermal public-private venture workshop held jointly by GPO and LMI. Participants at the workshop included representatives from industry and government.

Table 4-1.
Existing Legal Instruments with Potential Application for Geothermal Contracting

Generic type	Specific agreement[a]
Conventional Geothermal Industry Agreement	1. Industry Lease 2. BLM Lease
Oil and Gas Industry Agreement	3. Domestic Exploration and Development Lease 4. International Work Agreement
Existing Government Instruments	5. FAR and DFARS 6. NPS Concession Contract

[a]Volume II contains examples of most of these agreements.

ASSUMPTIONS

Before describing the various legal instruments, we need to establish explicitly what the instrument should accomplish. In our comparison of the various types of agreements in this chapter, we assume that private firms will provide the funds, expertise, equipment, and labor needed to develop DoD's geothermal resources. We also assume that DoD

- will not own or operate the plant or equipment, not even as a purchase option in the agreement;
- will continue to own and control all resources below ground level and the real estate itself;
- will control the resource depletion rate;
- will maintain control over anything that affects the military mission of the installation; and
- will oversee the operator's compliance with all applicable environmental requirements.

CONVENTIONAL GEOTHERMAL INDUSTRY AGREEMENTS

Industry Lease

DESCRIPTION

Geothermal development firms rarely own the land on which they operate. They use a legal instrument called a lease to obtain permission from the landowner or the owner of mineral rights to use the land. Although geothermal leases generally contain similar clauses, the industry has no "standard" lease. The BLM lease, described below, is the closest thing to a standard lease in the industry.

Land ownership in the United States can be complex. One or more persons can own the surface and the mineral rights, which is known as owning the land "in fee." Also separate parties can hold the surface rights and the mineral rights, and a mineral deed can convey all or some of the mineral rights beneath the land to another owner, which is known as "split estate." (In some foreign countries, mineral rights are held by the government.) A deed that conveys freedom for the use of mineral rights is usually called a "royalty deed." Such a deed is usually limited to a specific period.

A geothermal lease describes in detail the rights and obligations of the mineral rights owner (the lessor) and the geothermal firm (the lessee). Once a geothermal firm has located a potentially profitable geothermal resource, it must

approach the owner of the minerals rights to lease those rights. To obtain the right to drill exploratory wells and extract geothermal resources from the lessor, the lessee generally pays a bonus, a rental fee, and a royalty. The bonus is negotiated but is generally equivalent to the yearly rental and is the fee paid to the lessor for signing the lease.

The rental fee is the annual fee paid to the lessor to hold the lease and is based on the number of acres that are leased. This fee, again, is negotiated but typically ranges from $1 to $4 per acre per year for the term of the lease. The term of a private lease is generally 5 to 10 years. A lease may also include stipulations limiting surface use of the land to functions necessary for developing the resource and usually includes clauses requiring eventual restoration of the land. State environmental regulations also stipulate restoration requirements, which developers must follow regardless of the provisions of the lease.

The geothermal industry has no standard way to calculate royalties, with the possible exception of the methods described in the BLM lease. (We discuss various ways to calculate royalties in Appendix B.) A royalty is a share of the revenue interest. Two types of interest exist: revenue interest and working interest. Revenue interest allocates revenues among the parties to the lease. In a typical lease, the owner of the mineral rights (the lessor) receives a revenue interest, i.e., a straight percentage of the revenue. A working interest, although apportioned in relationship to the revenue, is separate; it allocates responsibility for the operating cost of maintaining the wells in working order. In a joint venture, the working interest may change as one or more of the partners becomes unable or unwilling to provide additional funds to undertake necessary "workovers" (well overhauls and repairs) or to drill additional development wells. In that event, the joint venture partners can renegotiate their respective shares of the revenue interest and the working interest. The lessor's revenue interest, however, is unaffected.

The owner of the surface rights has to accept the firm's lease as an easement because the lessee (the geothermal company) has purchased the legal right to access the subsurface mineral resources from the mineral-rights owner. The surface owner, however, has the right to compensation for damages and disruptions. Since exploration and production disrupt the surface, a separate clause usually specifies compensating payments to the surface-rights owner. Although the amount of such payments is determined by the surface owner's negotiating skills, it is normally based upon the value of the disrupted activity. For example, if wells and pipelines take up an acre of corn field, the surface owner will receive the market value of an acre of corn production. While a surface owner could negotiate a revenue interest instead of payments for surface disruptions, that rarely occurs.

As soon as commercial quantities of geothermal energy are produced, the rental fee ceases and the mineral owner's royalty revenues begin. Royalties are usually calculated as a percentage of "gross revenues." In the geothermal industry, gross revenue is not always easy to determine because geothermal liquids and gases have various potential uses; they usually generate electricity but can

also provide heat for industrial and agricultural uses. Additionally, the geothermal production process consumes some of the electricity that it generates to run the plant. Power losses also occur between the transmission source and the end user.

A lease may allow the lessee to subtract certain costs associated with the production of the resource when calculating gross revenue. Those allowable costs comprise the costs incurred between the wellhead and the end use. The lessor needs to ensure that allowable costs are clearly and unambiguously defined so that the lessee's reported allowable costs do not become excessive. Small lessors may not have the means to audit the calculation of gross revenue.

Because no standard lease exists and because geothermal firms normally are unwilling to divulge lease terms in detail, we have not included an example of an industry lease in this report.

PROS

- The geothermal industry is used to and comfortable with this instrument.
- A geothermal lease is a relatively simple and straightforward legal agreement.
- The Navy has established a precedent for using non-FAR leases in NAVFAC's leasing of temporarily surplus Navy lands for agricultural use.

CONS

- The use of any sort of instrument that is termed a "lease" may provide BLM with an opening to take geothermal development away from DoD, reducing its control over encroachment.
- The industry lease would need to be modified to include sufficient safeguards for DoD's mission requirements.
- Normal lease terms do not cover alternative ways to receive royalty payments, such as in-kind electric power, rate reductions, or other methods that may be mutually advantageous.

Bureau of Land Management Lease

DESCRIPTION

The BLM manages geothermal development on all Federal lands except for military lands, and it manages the development of most government mineral resources. One of its primary goals is to encourage private development of the natural resources on government lands. To do so, it uses a standard lease mechanism that covers the term of the agreement, revenues, allowable use of the land, and eventual land restoration. A BLM lease is not restricted by the terms of the FAR; it is governed by its own statutory authority, which is quite separate from the authority underlying the FAR.

An example of a BLM lease is included in Appendix C. All such leases specify the rentals and royalties due to the government for making the land available. Revenues include an annual rental per acre during exploration and development, and royalty of between 10 and 15 percent of the value of the steam or other form of energy derived from production and sold by the lessee. The rental fees, although nominal, escalate after the fifth year and annually thereafter. The lease also specifies a royalty of at least 5 percent on sales of de-mineralized water that is not used in production. An authorized officer may, however, waive or reduce the standard rents and royalties if it is necessary to promote development.

The royalties are calculated from gross revenues. To calculate gross revenue, the Minerals Management Service (MMS) of the Department of the Interior has developed a "net back" procedure that accounts for electricity used in producing the resource as well as the various uses of the resource. Simply put, the geothermal firm is allowed to subtract certain costs associated with the production of the resource. They consist of costs incurred between the wellhead and the end user, including electricity transmission-line losses. For geothermal energy not used to generate electricity, MMS imputes a value based on the least expensive alternative fuel source. Because MMS is part of a large organization with many geothermal leases, it can afford a well-trained staff to audit and validate the lessee's reported cost.

The lease covers a primary term of 10 years. However, BLM can extend that term as long as the lessee continues to generate steam or electricity in commercial quantities (or as long as the operator is making diligent efforts to do so). Nevertheless, BLM's regulations do not allow extension of the lease for more than 40 years after the end of the primary term, making a maximum term of 50 years in total. The original lessee has a preferential right to renew after 50 years for a second term of 40 years if it is still producing, and the land is not needed for other purposes.

In addition, the lease defines conditions for readjusting the original terms at 20-year intervals and 35 years after the start of the lease. The lease also establishes surety bond requirements.

The lease allows the developer to use only enough surface area to operate. The developer is limited to the extraction of geothermal liquids (or gases) and is not entitled to any other minerals (other than those derived from geothermal liquids). The BLM contracting officer decides the boundaries of land for bid, and the lands are then leased competitively to the highest qualified bidder. If a developer submits a proposal to develop land that is not a known geothermal resource area (KGRA), however, BLM is authorized to negotiate a sole-source lease with that developer.

The BLM's regulations limit the amount of land that can be leased to any one person or firm. No individual or unit can hold more than 51,200 acres in any one state and each individual package is normally limited to 2,560 acres. The lessee is required to return the land to its former condition at the end of the lease.

PROS

- The geothermal industry is used to the BLM's lease and comfortable with it.
- A BLM lease is a relatively simple and straightforward legal agreement.
- The lease has been in existence for many years and its stipulations are codified in Federal law and regulation.
- The lease contains protections for common Federal interests such as the environment and cultural assets, equal employment opportunity and nondiscrimination, all of which are DoD interests as well.

CONS

- The terms of the contract, including fixed contract terms, are inflexible. The lease cannot be tailored to the specifics of the site, to operational requirements, or to varying economics.
- The lease does not include sufficient safeguards for DoD's mission requirements.
- The lease terms would not allow DoD to receive royalty payments in alternative ways such as in-kind electric power, rate reductions, or other methods that may be mutually advantageous.
- The reliance on escalating rental fees during development increases the cost to the developer at a time when risks are high. Moreover, the escalating fees do not appear particularly effective in encouraging due diligence, considering the nominal nature of the fees.
- The lease's definition of due diligence is imprecise.

- Reliance on references to BLM regulations is not an ideal contracting method – the contract should be as complete and self-contained as possible, with minimal reliance on and reference to other documents.

- The BLM's philosophy of maximizing private development on government land may conflict with DoD's main objective of preserving the military mission by controlling encroachment.

- The use of a BLM-type lease may provide BLM with an opening to take the geothermal program back from DoD, removing DoD's control over encroachment and resource depletion rates.

- The BLM leases do not guarantee the best sharing of risks and revenues between the government and the lessee.

Oil and Gas Industry Agreements

Domestic Exploration and Development Leases

Description

As with geothermal developers, oil and gas companies usually need to obtain written permission, by means of a lease, to use the land on which they drill and from which, when successful, they pump crude oil, natural gas, or both. Oil and gas leases vary; as with private geothermal leases, no "standard" lease exists. Nevertheless, most oil and gas leases follow certain guidelines. They generally describe the land to be explored and perhaps developed; the amount and the method of payment; and the length of the lease (the "primary term"). They also specify limits on what the company may and may not do. Usually, the lease specifies that operations must be carried out within a certain period or else the lease expires. In other words, the company must exercise "due diligence." Most important, perhaps, the lease stipulates the amount of payment, the "royalty," due to the owner of the mineral rights if a producing well is brought in.

A typical royalty in the United States is normally some fraction of the value of production at its gross market price at the wellhead. In the oil and gas business, this calculation is relatively easy. In the case of petroleum, for example, the lessor's revenue interest equals the number of barrels of oil produced times the published wellhead price of that particular grade of oil. Royalty calculations in conventional oil and gas leases are much simpler than royalty calculations in geothermal leases.

As with geothermal leases, the oil and gas industry normally distinguishes between revenue and working interest in the development effort. In a typical oil and gas lease, the owner of the mineral rights, the lessor, receives a one-eighth revenue interest and does not take on a working interest.

Because oil and gas exploration, like geothermal exploration, disrupts the surface of the land, leases usually incorporate clauses specifying payments for interrupting the owner's surface activities. We have included an example of an oil and gas lease in Appendix D.

PROS

- Oil and gas leases are similar to geothermal leases and therefore, contain clauses familiar to geothermal developers.
- Such leases incorporate years of experience in allocating the risks and rewards of natural resource development.
- Private leases are normally very flexible; all terms are negotiable.

CONS

- The DoD should avoid an instrument that is termed a lease and is similar to BLM's legal agreement.
- Oil and gas exploration and development is similar to those for geothermals, but significant differences exist in the absence of a worldwide market for electricity similar to that for oil and gas. Unlike oil and gas, electricity is not a fungible commodity and royalty calculations are not as simple.
- Unlike oil and gas, the "market price" for electricity depends upon a power-sales agreement between the developer and the utility, which may come after the lease.

International Work Agreement

DESCRIPTION

An international work agreement is a contract between a foreign government that owns oil and gas resources and a private oil company for the exploration and development of the government's resources. The private company provides all of the technical, financial, and economic resources required to perform the contract. All costs, unless specifically stated otherwise in the agreement, are the responsibility of the oil company.

While the government bears no risk for the development and production of hydrocarbons, those hydrocarbons remain the property of the government. The oil company receives payment in kind for all of the hydrocarbons that are produced. The government retains the first right of refusal to purchase those hydrocarbons.

An international work agreement specifies the term of the contract. An example of such an agreement between PetroPeru (the Peruvian government oil company) and the Mobil Oil Corporation (a private oil company) is included in Appendix E. Essentially, the agreement is a license for the oil company to explore a specified area to determine whether commercially exploitable hydrocarbon resources exist and to extract those resources under specified conditions.

The term of the Mobil-PetroPeru agreement is 30 years. Included within that term is an exploration phase of 6 years that can be extended for an additional year. Whatever remains at the end of the exploration phase is the production phase. A minimum guaranteed work program is specified for the exploration and development stages as well as for intermediate stages within those two broad phases of work.

The site is divided into sectors. In each sector in which a commercial strike is declared, the hydrocarbons are divided equally between PetroPeru and Mobil. Potential commercial discoveries are followed by a notice to PetroPeru and a specified program of confirmation and development plans, all subject to approval by PetroPeru. The oil company's Declaration of Commercial Discovery triggers the development phase.

This type of agreement attempts to strike a balance between due diligence in meeting the agreement's scheduled milestones and flexibility, which provides a fairly broad period in which to perform. The start of exploration is defined as the first seismic shot. If the contractor completes the minimum work program and abandons the site, no penalty is assessed. Any area that is not in production by the sixth year of the exploration phase reverts to PetroPeru, unless further exploration is approved. However, if the minimum work program is not completed as scheduled, the oil company pays compensation for the work not finished. That penalty is secured by a bank bond.

The private oil company submits its proposed annual work program for each year of the development phase, subject to PetroPeru's approval. PetroPeru monitors the private firm's operations and gives notice of any problems. An arbitration committee settles any disagreements. The two parties may mutually agree to change or adjust the procedures, notices, planning requirements, and annual work programs.

The agreement has extensive, detailed provisions covering everything from taxes, administrative details, the use of state-owned assets (such as pipelines), protection of the environment and native communities, accounting requirements (including the auditing and inspection of books), and causes for termination and the resulting responsibilities of the private company.

PROS

- This agreement incorporates long experience in the allocation of risks and rewards between private resource developers and the government agencies that own mineral resources.
- The agreement is not a lease and does not resemble the BLM lease.
- The agreement provides flexibility during the exploration phase, although it sets minimum requirements.

CONS

- The geothermal industry is not used to this mechanism.
- In contrast to domestic oil and gas leases, agreements between private oil companies and governments are typically long and extremely detailed. While international oil companies are used to such detailed contracts, a similar contract would add to the transaction cost of the typical geothermal firm.
- By placing the full risk and responsibility of exploration plus development in the hands of the private firm, the government must yield a higher share of the eventual revenue. The respective shares depend upon the likelihood of commercial discoveries. Private firms can obtain a *fifty-fifty split only in areas* with less potential; in countries with a high expectation of commercial strikes, the private firm's share is normally lower.
- As with a domestic oil and gas lease, the agreement acknowledges the fungibility of oil and gas, which is not the case for geothermal energy.

EXISTING GOVERNMENT INSTRUMENTS

Federal Acquisition Regulation and Defense FAR Supplement

DESCRIPTION

The FAR and the DFARS cover every stage of contracting, including planning for a purchase, advertising and soliciting bids from potential sellers, the selection of a contract awardee, administration and oversight of contract performance, and contract termination.

PROS

- The FAR constitutes the status quo and, therefore, using it requires no changes in the way that NAVFAC is currently doing business.
- Many Federal contracting officers view this approach as the easiest and safest, posing the least risk to themselves and the government.
- The FAR makes possible a variety of approaches to reaching an agreement.

CONS

- Private geothermal developers have shown themselves reluctant to bid on projects tied to conventional FAR and DFARS contracting mechanisms.
- Experienced geothermal development firms do not have personnel familiar with the FAR or with the DFARS. Dealing with such contracts, therefore, adds significantly to the transaction cost when dealing with the government.
- From the industry point of view, the FAR magnifies the real and perceived risks they face. In particular, the Davis-Bacon Act and the Buy American Act clauses add to the cost of doing business with the government. In a situation in which the decision to develop rests on an economic knife-edge, such added costs can cause a firm not to bid.
- The financial firms that provide capital for development also perceive added risks in dealing with the government; FAR mechanisms magnify those risks.
- Despite its flexibility, the FAR is geared toward the acquisition of goods and services, which makes it difficult to construct a straightforward agreement that "rents" out a DoD-owned resource.

National Park Service Concessions Contract

DESCRIPTION

The NPS uses private contractors to provide many visitor services, particularly food and lodging. Because it must provide such services without endangering the successful performance of its mission, it has developed a legal instrument, the concessions contract, that makes land available for private development while retaining ownership and a certain degree of control over that land. The standard NPS concessions contract language is included in Appendix F.

The NPS's primary objective is to preserve park resources for the use and enjoyment of the public and to act as a trustee for the environmental and cultural resources within the park. It designed its concessions contract to preserve that overriding national purpose. The contract allows a concessionaire to build and

operate a facility such as a hotel or restaurant. It provides access to the market and sufficient land on which to build while maintaining control over aesthetics, environmental compliance, and general land use. For the right to use the land for a specified period, the concessionaire pays various fees, including a royalty, to NPS.

The concessions contract establishes well-defined property interests. While the government continues to own the land, the concessionaire obtains a "possessory interest" in any "improvements" made upon the land. The contract places a value upon that interest. It also stipulates responsibilities for utility payments, accounting procedures, and returns to the government. The latter consists of an annual fee for the use of government property and services, a franchise fee or royalty based on a percentage of the gross receipts for the previous year or part of a year, and a late payment penalty. The concessions contract also allows for periodic fee adjustments and includes appeal provisions.

The contract can be terminated under certain conditions including default, the government's interest, and, of course, expiration of the contract. The government's right to terminate in its interest is defined in the contract but is quite broad; the contract can be canceled for reasons that have to do with "enhancing or protecting area resources or visitor enjoyment and safety." In such cases, the contractor receives financial compensation. The concessions contract lays out methods for settling claims and valuing fair compensation. Also included are clauses covering assignments, encumbrance, or sale of the concessionaire's interest.

In addition, the contract covers requirements for a bond and a lien. A surety bond may be required to protect the government's interest in faithful performance of the contract. Clauses in the contract also specify requirements for insurance and indemnity.

The contract spells out several aspects that would also be critical in any geothermal venture, including the following:

- Accounting rules, records, and procedures
- Dispute procedures
- Provision of NPS-provided services such as security and utilities and payment for those services
- Insurance requirements
- Liabilities and indemnification.

PROS

- The concessions contract is designed specifically to provide the use of government land while maintaining control over the government's primary mission in owning that land.

- With this contract type, NPS has already developed and tested contract clauses covering termination, valuation, payment of fees and royalties, appeals, and other essential matters. Especially attractive is the careful delineation of property interests (values) that the government and concessionaire have in the concession property.

CONS

- Private geothermal developers are not familiar with this legal instrument.

- This agreement is peculiar to the needs of NPS and would need to be tailored to the requirements of the geothermal industry and DoD.

CHAPTER 5

Recommendations for a Successful Geothermal Program

DEVELOP A UNIQUE LEGAL INSTRUMENT

We recommend that the Navy develop its own legal instrument to carry out the purposes of the geothermal program, generally, and individual geothermal projects, specifically. Furthermore, we recommend that instrument be called a "license agreement," not a contract, just as BLM calls its instrument a lease. The term license agreement has two advantages:

- It is the most accurate description of the business arrangement. The GPO wants to license a private developer to come onto government land, explore for and develop geothermal resources under strict controls to protect primary Federal interests and using only private funds, and sell any resulting power with a portion of the proceeds from sale going to the government as fee.

- The term avoids the use of the word contract, which for some government employees means only FAR-type documents, even though a host of other contracts and assorted legal instruments used by DoD and many other Federal agencies are not based on the FAR.

ESTABLISH A DEMONSTRATION PROJECT

We also recommend that NAVFAC establish a demonstration project to develop one or more license agreements and test their use. A demonstration project gives the Navy wide latitude to test innovative contracting approaches. DoD often establishes such projects to test innovative approaches to solving problems. Such projects explicitly recognize the need to depart from normal practices and authorize innovative approaches. Thus, they can help overcome any institutional barriers that threaten to slow or even stop beneficial programs such as geothermal development on DoD lands.

Ideally, the demonstration project will prove that the new type of license agreement will contribute materially to the success of geothermal development by DoD. The benefits include the institutionalization of that new type of agreement as well as the development of one or more geothermal resources as part of the demonstration. If a demonstration project proves the validity and the

success of this new approach, license agreements can eventually become the standard legal instrument for geothermal development on military property.

Reassign Responsibility for Geothermal License Agreements

We recommend that NAVFAC assign contracting authority to an organization that has the experience and culture to respond flexibly and rapidly to the unique requirements of geothermal development. The Southwestern Division of NAVFAC, the office currently assigned the responsibility for geothermal contracting, is apparently reluctant to depart from conventional FAR contracting procedures and, moreover, lacks the required experience with legal instruments not based on the FAR.

We suggest two more suitable Navy offices to manage the geothermal demonstration project. Although the geothermal development program is a DoD-wide program, keeping contracting authority within the Navy has the advantage of keeping all geothermal development activities under the umbrella of a single Military Service.

One likely candidate is the Procurement Department at NAWS, China Lake, which is already the site of a general contracting demonstration project with wide latitude for testing innovative contracting procedures. China Lake is also the location of the GPO and the collocation would enable the two offices to exchange information and advice more easily.

A second potential candidate is the Office of Naval Research (ONR), which has experience carrying out nonconventional contracting procedures in its R&D role. Even when ONR uses appropriated funds to purchase certain products or services, it often uses legal instruments such as cooperative agreements not based on the FAR, and those instruments bear some similarity to the type of public-private venture needed for successful geothermal development.

By adopting these recommendations, we believe that the Navy can return momentum to DoD's geothermal program. At stake is the Navy's reputation for managing the program on behalf of all the Military Services. A successful program will help protect lands for DoD's mission, promote the substitution of renewable energy for petroleum fuels, and generate revenues and cost savings for DoD installations.

APPENDIX A

Stakeholder Concerns

In May 1993, the Geothermal Program Office (GPO) and the Logistics Management Institute (LMI) jointly sponsored a workshop to bring together interested and knowledgeable parties to discuss contracting alternatives for developing geothermal resources on DoD land. One of the products of that workshop was the list of stakeholder concerns contained in Table A-1. Stakeholders are those parties who have a direct stake in the successful exploitation of a geothermal resource. Specifically, the workshop identified the Navy (or DoD), the developer, the utility, and the bank (or other financial backer) as the major stakeholders in most geothermal development projects.

Table A-1 lists the concerns identified by the workshop along with the parties who hold those concerns. As the table illustrates, most concerns are shared by more than one stakeholder. Moreover, a large number of concerns are shared by DoD and various private parties. For that reason, we believe a partnership is more likely to succeed than an adversarial relationship. Both sides share many of the same concerns, have to solve the same problems, and are working toward the same end: a project that produces commercial quantities of geothermal energy. When successful, geothermal energy on DoD land has many potential winners.

Table A-1.
Concerns Held by Stakeholders in a Geothermal Development Project

Concern	Stakeholders			
	Navy	Developers	Utilities	Financial firms
Contract term renewability	X	X	X	X
Compensation for risk	X	X		
Compensation known up front	X	X		X
Probability of success	X	X		X
Resource/reservoir risk	X	X		
Mutual renegotiation	X	X		X
Bonding requirements	X	X		
Termination conditions/provisions	X	X	X	X
Power sales agreements	X	X	X	X
Agreement complexity		X		
Davis-Bacon Act		X		
No reference to outside documents		X		

Table A-1.
Concerns Held by Stakeholders in a Geothermal Development Project (Continued)

Concern	Stakeholders			
	Navy	Developers	Utilities	Financial firms
Defined operational conditions known upfront	X	X	X	X
Time schedules/limits/interruptions in process	X	X	X	X
Dispute resolution	X	X	X	
Government guaranteed debt service		X		X
Define technological oversight	X	X	X	X
Appropriate technical requirements		X	X	
Assessment of risks, environmental, etc.	X	X		
Government delays/suspensions	X	X		X
No new technologies				X
Ability to renegotiate contract	X			X
Specify schedule milestones			X	
Performance guarantees	X		X	
Mission protection	X			
Resource management	X			
Developer success	X			
Diligence	X			
Contract familiarity	X	X		X
Partnership agreement	X		X	X
Control (approval) over assignment	X			
Contract method	X	X	X	X
Safety	X			
Security	X			
Environmental protection	X			

APPENDIX B

Royalty Calculations

INTRODUCTION

The geothermal industry has no standard royalty terms with the possible exception of those in the Bureau of Land Management (BLM) lease. The Minerals Management Service (MMS) of the Department of the Interior issues regulations concerning the calculation of royalties.[1] The calculations embodied in those regulations are complex and may not always provide the government with the best return. Therefore, DoD needs to explore alternative approaches to allocating funds between the lessor (the mineral rights owner) and lessee (the geothermal firm).

Allocating geothermal revenues and expenses fairly between the lessor and lessee is a complex process because geothermal energy is not a fungible commodity with an established market. Unlike crude oil and natural gas, whose price information is determined in a nearly continuous fashion through spot market transactions, geothermal energy has no spot market. The absence of such a market is attributable to the small size of the industry and the fact that geothermal energy cannot be transported far without significant losses and cannot be stored. The price for energy generated at a particular site is determined by contractual negotiations at a single time or, at most, periodically. The nature of geothermal energy requires that it be used immediately (converted to electricity or some other energy form) close to where it is found.

Nevertheless, geothermal energy does have a market value, even if that value is often hard to determine. In theory, the value depends upon the closest substitutes available at the given site. In practice, it depends upon the local utility's "avoided cost," or the price at which public utilities are required by law to purchase electricity from qualified small power producers. The Public Utility Regulatory Policies Act of 1978 established the conditions under which utilities are required to acquire additional electricity. To determine the price at which utilities purchase that electricity, public utility commissions establish an avoided cost of electricity, which is generally the implied cost per kilowatt hour of building and operating a new power plant.

The geothermal industry, unlike the oil and gas industry, has not settled on a standard method for calculating royalties. The industry uses several approaches; we discuss five of them below.

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[1] *Federal Register*, Volume 56, Number 217, 8 November 1991, pp. 57256 - 57287.

ALTERNATIVE APPROACHES

Netback Valuation

The MMS currently uses this method for calculating royalties on BLM leases. Under this method, certain costs and investment returns are first deducted from the gross proceeds. The royalty is a percentage of those adjusted gross proceeds. This method attempts to isolate the costs and revenues associated with the conversion of geothermal energy into a usable form of energy (such as electricity).

Nevertheless, the netback valuation method does not recognize all of the costs downstream from the wellhead. Royalties calculated using this method are generally greater than a lessee and lessor would negotiate under an arm's-length agreement. Although the process attempts to allocate revenues "fairly," it does not recognize the true market value of geothermal energy. Moreover, the method is administratively burdensome. The lessor must monitor the lessee's activities and records, and the lessee must comply with the lessor's reporting requirements.

Proportion of Profits

This method calculates royalties as the proportional share of the geothermal project's net operating income attributable to the geothermal field. The proportional share is based on the ratio of capital invested in developing the geothermal field to capital invested in the entire geothermal project (field development, power plant construction, and transmission line installation). This method can be viewed as a variation of the netback valuation method.

Alternative Fuels

The alternative fuels method calculates the value of "no sale" geothermal resources for both electrical generation and direct utilization. Here, the value of the geothermal resource is determined by the caloric value (or cost) of the conventional fuel (such as oil, gas, or coal) displaced by use of the geothermal resource.

In theory, the value of geothermal energy depends upon the closest substitutes available at the given site. In practice, however, the value relationship between geothermal energy and alternative fuels is not constant. The processes for converting various fuels into energy are different and the cost of conversion changes as prices and technology vary.

Percent of Gross Revenues

Under this method, total revenues are calculated by applying a negotiated royalty, typically between 5 and 15 percent, to the value of gross production. No deductions are allowed and all revenues are the result of arm's length transactions. For example, the lease could base gross revenues on the published value of electricity sold in the retail market or on the purchasing utility's avoided cost. This method makes royalties easy to calculate and audit on behalf of both the lessor and lessee. However, selling geothermal energy under an arm's length agreement is not always possible.

Geothermal production uses electricity for various plant operations, including pumping injection wells. However, most leases exclude that electricity from the amount subject to royalty. Substantial electricity is often lost on the lines that transport power to the customer, normally a local utility. Gross production can be defined at the point of generation or, more commonly, at the point at which the electricity passes onto the utility grid. Royalties in the latter case, even if calculated as a percent of gross revenues, exclude electricity used by the plant and producing equipment and exclude losses on the connector lines.

Weighted Average

In this method, the lessee calculates a weighted average of the revenues derived from its own arm's length contracts for similar geothermal resources in the same or nearby fields. In order to apply this method, the lessee must operate other, similar fields and must have existing arm's length contracts with the lessors of those fields.

This method bases royalty payments on existing sales contracts that do not necessarily reflect current market values. Thus, the weighted-average method tends to skew geothermal values toward obsolete prices. Moreover, this method ignores variations among geothermal resources and differing power plant efficiencies.